



U.S. Department
of Transportation

**Federal Aviation
Administration**

**U.S. Department of Transportation
Federal Aviation Administration**

STANDARD PRACTICE

PREPARATION OF

WEB SERVICE DESCRIPTION DOCUMENTS

FOREWORD

This standard is approved for use by all Departments of the Federal Aviation Administration (FAA).

This standard specifies the minimum acceptable content for documenting web services within the FAA.

This standard is one of several related standards that together define FAA's requirements for describing and registering services. A future Handbook will provide guidance for using these standards in concert with the FAA Enterprise Architecture, FAA Order 1375.1 Information/Data Management, and other relevant FAA initiatives.

This standard has been prepared in accordance with FAA-STD-068, Department of Transportation Federal Aviation Administration, *Preparation of Standards (December 2009)*.

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Table of Contents

1	SCOPE	1
1.1	Background	1
1.2	Intended Use	2
1.3	Applicability	3
2	APPLICABLE DOCUMENTS	3
2.1	Government Documents	3
2.2	Non-Government Documents	4
2.3	Order of Precedence	5
3	DEFINITIONS	6
3.1	Key Words	6
3.2	Terms and Definitions	6
3.3	Abbreviations	10
4	GENERAL REQUIREMENTS	11
4.1	Format	11
4.1.1	Text, Grammar and Style	11
4.1.2	Page Numbering	11
4.1.3	Page Headers	11
4.1.4	Use of Hyperlinks	12
4.1.5	Use of Diagrams	12
4.2	Structure	12
5	DETAILED REQUIREMENTS	16
5.1	Cover Page	16
5.2	Approval Page	16
5.3	Revision Record Page	16
5.4	Table of Contents	17
5.5	Scope	18
5.6	Applicable Documents	18
5.7	Definitions	18
5.8	Web Service Properties and Capabilities	19
5.8.1	Service Profile	19
5.8.1.1	Service Provider	20
5.8.1.1.1	Point of Contact	20
5.8.1.2	Service Consumers	21
5.8.1.3	Service Functionality	21
5.8.1.4	Security	22
5.8.1.4.1	Roles	22
5.8.1.4.2	Access Control Mechanisms	22
5.8.1.4.3	Security Policies	23
5.8.1.5	Qualities of Service	23
5.8.1.6	WSDL Document	24
5.8.2	Service Interfaces	25
5.8.2.1	Types	26
5.8.2.2	Messages	28
5.8.2.3	Operations	28
5.8.2.4	List of Interfaces	30
5.8.3	Service Implementation	30
5.8.3.1	End Points	31
5.8.3.1.1	Associated Interface	32
5.8.3.1.2	Communication Protocol	32

5.8.3.1.3	Messaging Protocol	32
5.8.3.1.4	Network Address.....	33
5.8.3.1.5	End Point-Specific Qualities of Service.....	33
5.9	Appendixes	33
6	APPENDIXES	34
	Appendix A. Example of a WSDD Cover Page.....	34
	Appendix B. Example of a WSDD Approval Signature Page	35
	Appendix C. Example of a WSDD Revision Record Page	36
	Appendix D. Example of WSDD Section 4.3 for a Service whose End Points differ only by Network Address	37

List of Figures

Figure 1.	WSDD Use Case Diagram	3
Figure 2.	Structure of a WSDD.....	13
Figure 3.	Correlations between Sections of WSDD and WSDL Schema Elements	15
Figure 4.	WSDD Table of Contents	18
Figure 5.	Structure of WSDD Service Profile Section.....	19
Figure 6.	Structure of WSDD Service Interfaces Section.....	26
Figure 7.	Structure of WSDD Implementation Section	31

1 SCOPE

This standard provides a set of requirements for developing a Web Service Description Document (WSDD). The WSDD provides the details needed to sufficiently describe a [web service](#) as a part of FAA's implementation of [Service Oriented Architecture \(SOA\)](#).

- This standard does not prescribe or suggest any technological solutions for implementing a web service. Rather, it seeks to provide a [semantic](#) basis for a [service description](#) that is flexible enough to accommodate different web service implementations for use across multiple business domains.
- This standard does not specify any configuration management (CM) or quality assurance (QA) policies, rules or assertions to which the developed WSDD may be subjected.

1.1 Background

In order for a [service consumer](#) to effectively use a [service](#) provided by a [service provider](#), the consumer needs the proper information about the service's properties and functionalities, i.e., the service description. The service description includes the "message formats, datatypes, transport protocols, and transport serialization formats that should be used between the [requester agent](#) and the [provider agent](#). It also specifies one or more network locations at which a provider agent can be invoked, and may provide some information about the message exchange pattern that is expected." [27] A common representation of this information is through use of Web Service Description Language (WSDL), and a common approach for [discovering](#) this information is through a distributed service [registry](#) such as UDDI.

Although both WSDL and UDDI are fundamental for SOA implementation and universally accepted, they "generally do not prove useful in explaining details about service behavioral characteristics." [26] Since both are expressed in a machine-processable and not a human-readable format, they can only "operate at the syntactic level and lack the semantic expressivity needed to represent the requirements and capabilities." [24] They are not designed to convey information that may be critical during the decision-making and development process, e.g., service behavior under certain conditions or policy restrictions on a server.

Today's SOA industry is working on addressing that lack of semantic information in web service technology, with the most noticeable effort being undertaken by the Semantic Web community to define an ontological web language ([OWL-S](#)) as well as other efforts including [WSDL-S](#), [METEOR-S](#), and [WSMO](#).

A good method for defining a service description that can be both machine-processable and human-readable was set forth by MITRE Corporation in developing a Service Definition Framework [25] realized through the DoD Global Information Grid (GIG) Net-Centric Implementation Document [1]. This standard closely follows the paradigm established in the SDF.

In preparation for transitioning today's FAA information systems to operate in a net-centric environment, the FAA has also recognized the importance of defining a common web service description format.

1.2 Intended Use

The WSDD provides a set of human-understandable information about a web service, information that can be employed in various settings and artifacts. This information will be used by various individuals, including services architects, business managers, service agents' developers and vendors, and service consumers, at different points of a service's life cycle.

The data contained in a WSDD will be used to facilitate the construction and deployment of consumer agents; it may be used by people to locate appropriate services, and it may be suitable for a service-seeking or a service-publishing agent. In other words, the service description will serve as a basis for both machine-consumable and human-understandable artifacts.

Over the last several years there has been a steady movement toward establishing a layer of machine-*understandable* data (i.e., a semantic model) suitable for automated software agents and sophisticated search engines, referred to as the Semantic Web. The semi-structured format of a WSDD aims at providing the building blocks for creating semantic models. A semantic model captures the terms and concepts used to describe and represent an area of knowledge or some part of the world, including a software system. A semantic model ordinarily includes concepts in the domain of interest, relationships among them, their properties, and their values. Usually this model is described as an ontology.

The following use case diagram is a high-level view of the intended use of a WSDD.

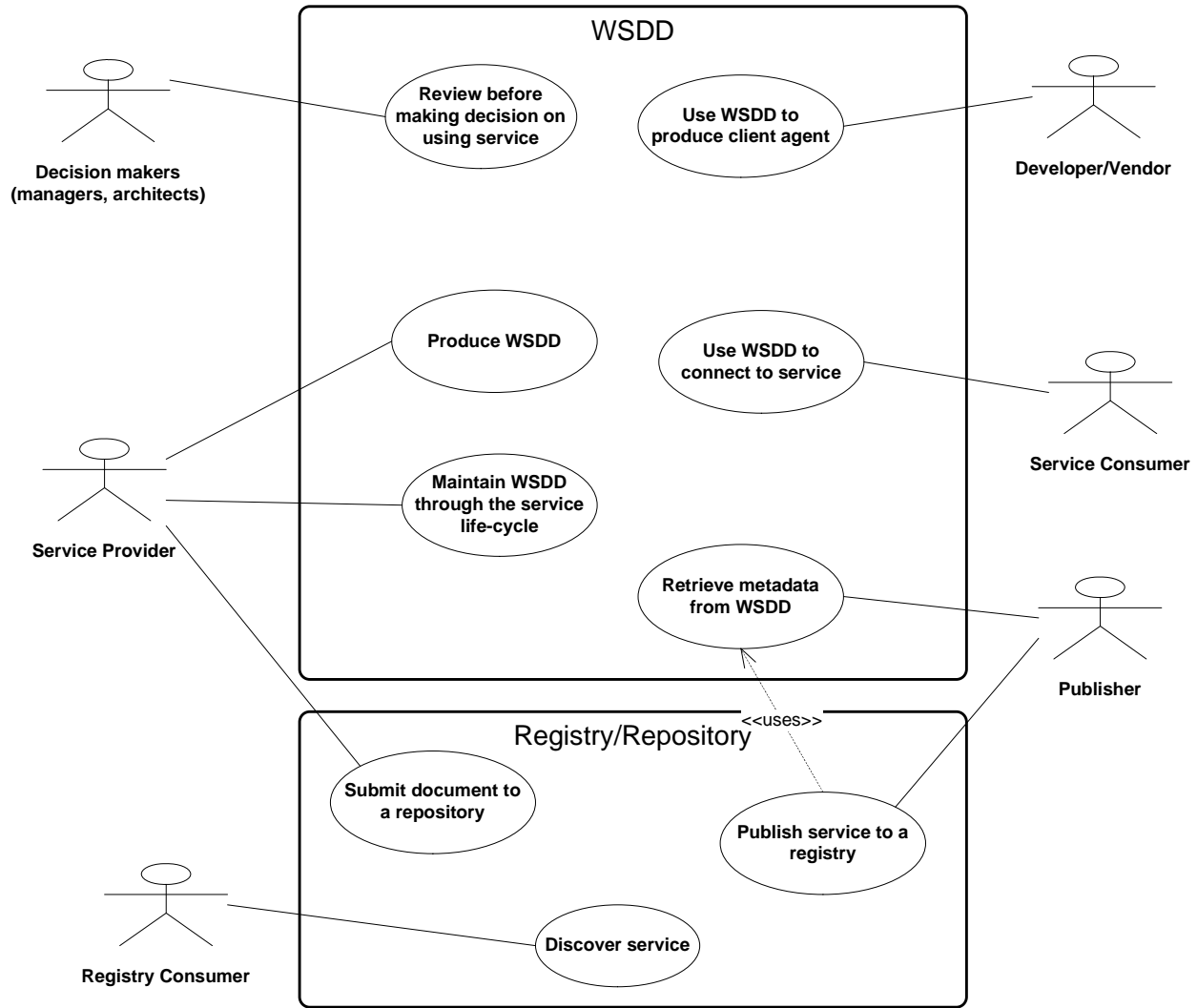


Figure 1. WSDD Use Case Diagram

1.3 Applicability

This standard is applicable to all FAA programs responsible for developing services as part of the FAA implementation of a service-oriented architecture (SOA).

2 APPLICABLE DOCUMENTS

2.1 Government Documents

- [1] DoD Global Information Grid (GIG) Net-Centric Implementation Document (NCID), Service Specification Template (S300), Version 3.0, 04 January 2007 (Not Available Online)

- [2] FAA Order 1000.36, FAA Writing Standards
(http://www.faa.gov/documentlibrary/media/order/branding_writing/order1000_36.pdf)
- [3] FAA Order 1375.1D, Information/Data Management
(<http://www.faa.gov/documentLibrary/media/Order/1375.1D.pdf>)
- [4] FAA Order 1600.75, Protecting Sensitive Unclassified Information Policy
(<http://www.faa.gov/documentLibrary/media/directives/nd/ND1600-75.pdf>)
- [5] FAA Order 1700.6C, FAA Branding Policy, Use of the FAA Logo, FAA Signature, and DOT Seal
(http://www.faa.gov/documentLibrary/media/order/branding_writing/Branding_Order_17006.pdf)
- [6] FAA-STD-060b, Data Standard for the National Airspace System
(http://www.faa.gov/air_traffic/nas/system_standards/)
- [7] FAA-STD-063, XML Namespaces
(http://www.faa.gov/air_traffic/nas/system_standards/)
- [8] FAA-STD-064, Web Service Registration
(http://www.faa.gov/air_traffic/nas/system_standards/)
- [9] FAA-STD-066, Web Service Taxonomies
(http://www.faa.gov/air_traffic/nas/system_standards/)
- [10] Federal Standard 1037C, Glossary of Telecommunication Terms, 1996
(<http://www.its.bldrdoc.gov/fs-1037/fs-1037c.htm>)
- [11] NAS System Engineering Manual: Version 3.1:06/06/06
(http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/operations/sysengsaf/seman/)
- [12] U.S. Government Printing Office Style Manual
(<http://www.gpoaccess.gov/stylemanual/>)

2.2 Non-Government Documents

- [13] IETF RFC 2119, Key words for use in RFCs to Indicate Requirement Levels
(<http://www.rfc-editor.org/rfc/rfc2119.txt>)
- [14] IETF RFC 2828: Internet Security Glossary: Network Working Group: May 2000
(<http://www.ietf.org/rfc/rfc2828.txt>)
- [15] IETF RFC 3986 Uniform Resource Identifier (URI): Generic Syntax, Network Working Group, January 2005 (<http://www.rfc-editor.org/rfc/rfc3986.txt>)
- [16] ISO/IEC JTC1 SC32 N1105: Information technology – Metadata Interoperability and Bindings (MDIB) Part 002: Common vocabulary: 2004-04-12
(<http://jtc1sc32.org/doc/N1101-1150/32N1105T-CD20944-002.pdf>)
- [17] ISO/IEC 6523-1:1998 Structure for the identification of organizations and organization parts (http://www.iso.org/iso/catalogue_detail?csnumber=25773)
- [18] ISO/IEC 11179, Information Technology - Metadata Registries (MDR), Parts 1 - 6
(<http://metadata-standards.org/11179/>)

- [19] ISO/IEC 12207:1995 Information technology -- Software life cycle processes
(http://www.iso.org/iso/catalogue_detail.htm?csnumber=21208)
- [20] NSA Glossary of Terms Used in Security and Intrusion Detection, NSA, April 1998
(<http://www.sans.org/resources/glossary.php>)
- [21] OASIS Reference Model for Service Oriented Architecture 1.0, 12 October 2006
(<http://docs.oasis-open.org/soa-rm/v1.0/soa-rm.pdf>)
- [22] OASIS Reference Ontology for Semantic Service Oriented Architectures: Public Review 1, 5th November 2008 (http://www.oasis-open.org/apps/group_public/download.php/29909/Reference%20Ontology%20for%20Semantic%20Service%20Oriented%20Architectures_Public_Review_1.doc)
- [23] OWL-S: Semantic Markup for Web Services W3C Member Submission 22 November 2004 (<http://www.w3.org/Submission/OWL-S/>)
- [24] Semantic Annotations for WSDL and XML Schema - W3C Recommendation 28 August 2007 (<http://www.w3.org/TR/sawSDL/>)
- [25] Service Definition Framework: MITRE Christopher Bashioum February 2006
(<http://colab.cim3.net/file/work/SICoP/2006-08-15/ServiceDefinitionFrameworkSOAFWGv3.ppt>)
- [26] Service-Oriented Architecture: Concepts, Technology, and Design: Thomas Erl, Prentice Hall, 2005 (Available from the publisher)
- [27] Web Services Architecture, W3C Working Group Note 11 February 2004
(<http://www.w3.org/TR/2004/NOTE-ws-arch-20040211>)
- [28] Web Services Description Language (WSDL) 1.1 W3C Note 15 March 2001
(<http://www.w3.org/TR/wsdl>)
- [29] Web Services Description Language (WSDL) Version 2.0 W3C Recommendation 26 June 2007 (<http://www.w3.org/TR/wsdl20>)
- [30] Web Service Description Requirements, W3C Working Draft, J. Schlimmer, 28 October 2002 (<http://www.w3.org/TR/2002/WD-ws-desc-reqs-20021028/>)
- [31] W3C Web Services Policy Framework 1.5 (<http://www.w3.org/2002/ws/policy/>)
- [32] Web Service Semantics - WSDL-S W3C Member Submission 7 November 2005
(<http://www.w3.org/Submission/WSDL-S/>)
- [33] W3C XML Schema (<http://www.w3.org/XML/Schema>)
- [34] XML Information Set (Second Edition) W3C Recommendation 4 February 2004
(<http://www.w3.org/TR/xml-infoSet/>)

2.3 Order of Precedence

In the event of conflict between the documents listed herein and the contents of this Standard, the contents of this FAA-approved Standard SHALL be the superseding requirement.

3 DEFINITIONS

3.1 Key Words

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [13]. These keywords are capitalized when used to unambiguously specify requirements. When these words are not capitalized, they are meant in their natural-language sense.

All examples in the document are labeled as "non-normative", which means they are not to provide a canonical implementation for use in a registry or artifact, but merely to illustrate technical features of a particular approach.

3.2 Terms and Definitions

<i>Access Control</i>	Protection of system resources against unauthorized access; a process by which use of system resources is regulated according to a security policy and is permitted by only authorized entities. (RFC 2828 [14])
<i>Agent</i>	See software agent .
<i>Business Function</i>	A characteristic action or activity that needs to be performed to achieve a desired objective, or in the context of this standard, to achieve a real world effect. (Adapted from FAA System Engineering Manual [11])
<i>Data Element</i>	A unit of data that is considered, in context, to be indivisible. (Adapted from ISO/IEC JTC1 SC32 N1105 [16])
<i>Discovery</i>	The processes through which a service consumer may search for and find services, (generally done by providing criteria to search for against a corpus of service metadata which service providers have provided to describe their services).
<i>Effect</i>	A state or condition that results from interaction with a service. Multiple states may result depending on the extent to which the interaction completes successfully or generates a fault.
<i>End Point</i>	An association between a fully-specified concrete protocol and/or a data format and a network address, often specified by a URI , that is used to communicate with an instance of a web service. (Adapted from WS Description Requirements [30])
<i>FAA Data Registry</i>	The official source of the FAA's data standards. The FDR (http://fdr.gov/fdr/Home.jsp) is a web-enabled system that provides ready access to the agency's standards and is compliant with the International Organization for Standardization/International Electrotechnical Commission (ISO/IEC) Standard 11179 [18]. (FAA Order 1375.1d [3])

<i>Fault</i>	A condition that causes a functional unit to fail to perform its required function. (Adapted from FS 1037 [10])
<i>Hyperlink</i>	In hypertext or hypermedia, an information object (such as a word, a phrase, or an image; usually highlighted by color or underscoring) that points (indicates how to connect) to related information that is located elsewhere and can be retrieved by activating the link. (NSA Glossary [20])
<i>Input</i>	Data entered into, or the process of entering data into, an information processing system or any of its parts for storage or processing. (Adapted from ISO/IEC JTC1 SC32 N1105 [16])
<i>Interface</i>	A logical grouping of operations . An Interface represents an abstract web service type, independent of transmission protocol and data format. (WS Description Requirements [30])
<i>Message</i>	A basic unit of communication from one web software agent to another sent in a single logical transmission.
<i>Metadata</i>	Data that defines or describes other data. (ISO/IEC 11179 -1 [18])
<i>METEOR-S</i>	A work focusing on the application of semantics to workflow processes such as e-commerce and e-services, which are created from the composition of Web Services or other components. See http://lsdis.cs.uga.edu/proj/meteor/SWP.htm .
<i>Open Standard</i>	A recognized national or international platform-independent standard that is developed collaboratively through due process, is vendor neutral, and does not rely on commercial intellectual property.
<i>Operation</i>	A set of messages related to a single web service action. (WS Description Requirements [30])
<i>Organization</i>	A unique framework of authority within which a person or persons act, or are designated to act, towards some purpose. (ISO/IEC 6523-1:1998, 3.10 [17])
<i>Output</i>	Data transferred out of, or the process by which an information processing system or any of its parts transfers data out of, that system or part. (Adapted from ISO/IEC JTC1 SC32 N1105 [16])
<i>OWL-S</i>	Semantic Markup for Web Services. An OWL (Web Ontology Language)-based web service ontology, which supplies web service providers with a core set of markup language constructs for describing the properties and capabilities of their web services in unambiguous, computer-interpretable form. See http://www.daml.org/services/owl-s/ .
<i>Precondition</i>	A state or condition that is required to be true before an action can be successfully invoked.
<i>Protocol</i>	A formal set of conventions governing the format and control of interaction among communicating functional units. (FS 1037 [10])

<i>Provider Agent</i>	A software agent that is capable of and empowered to perform the actions associated with a service on behalf of its owner – the service provider . (WS Architecture [27])
<i>Quality of Service</i>	A characteristic or parameter that measures the value of the provided service .
<i>Real World Effect</i>	An ultimate purpose associated with the interaction with a particular service. It may be the response to a request for information or the change in the state of some entities shared between the participants in the interaction. (Adapted from OASIS SOA Reference Ontology [22])
<i>Registry</i>	An enabling infrastructure that uses a formal registration process to store, catalog, and manage metadata relevant to the services. A registry supports the search, identification, and understanding of resources, as well as query capabilities. (FAA-STD-064 [8])
<i>Requester Agent</i>	A software agent that wishes to interact with a provider agent in order to request that a task be performed on behalf of its owner - the service consumer .
<i>Role</i>	A predefined set of rules establishing the allowed interactions between a service consumer and the service.
<i>Role-Based Access Control (RBAC)</i>	A form of identity-based access control where the system entities that are identified and controlled are functional positions in an organization or process.
<i>Security</i>	The protection of information and data so that unauthorized persons or systems cannot read or modify them and authorized persons or systems are not denied access to them. (ISO/IEC 12207-1995 [19])
<i>Security Mechanism</i>	A process (or a device incorporating such a process) that can be used in a system to implement a security service that is provided by or within the system. (RFC 2828 [14])
<i>Semantics</i>	A conceptualization of the implied meaning of information that requires words and/or symbols within a usage context. (OASIS SOA Reference Model [21])
<i>Service</i>	An implementation-independent reusable operational function that may be discovered as self-describing interfaces, and invoked using open standard protocols across networks. See also Web service . (FAA-STD-064 [8])
<i>Service Consumer</i>	An organization that seeks to satisfy a particular need through the use of capabilities offered by means of a service. (Adapted from OASIS SOA Reference Model [21])
<i>Service Criticality</i>	A single value that represents the criticality of a service by expressing the significance given to a functional failure of that service. (FAA-STD-066 [9])
<i>Service Description</i>	The information needed in order to use, or consider using, a service. (Adapted from OASIS SOA Reference Model [21])

<i>Service Level Agreement (SLA)</i>	A set of pre-defined and established expectations for levels of performance, usually realistic and measurable, between a consumer(s) and a service provider.
<i>Service Oriented Architecture (SOA)</i>	A paradigm for organizing and utilizing distributed capabilities that may be under the control of different ownership domains. A SOA provides a uniform means to offer, discover , interact with and use capabilities to produce desired effects consistent with measurable preconditions and expectations.
<i>Service Provider</i>	An organization that offers the use of capabilities by means of a service. (Adapted from OASIS SOA Reference Model [21])
<i>Software Agent</i>	A running program that drives web services, both to implement them and to access them. (FAA-STD-064 [8])
<i>Taxonomy</i>	A controlled list of values by which to categorize or classify objects. (FAA-STD-064 [8])
<i>Uniform Resource Identifier (URI)</i>	A compact string of characters for identifying an abstract or physical resource. (IETF RFC 3986 [15]; FAA-STD-064 [8])
<i>Uniform Resource Locator (URL)</i>	A type of URI that identifies a resource via a representation of its primary access mechanism (e.g., its network "location"), rather than by some other attributes it may have. (IETF RFC 3986 [15]; FAA-STD-064 [8])
<i>Web Service</i>	A self-describing, self-contained, modular unit of software application logic that provides defined business functionality. Web services are consumable software services that typically include some combination of business logic and data. (FAA Order 1375.1d [3])
<i>WSMO</i>	Web Service Modeling Ontology (WSMO), an ontology for describing various aspects related to Semantic Web services. See http://www.wsmo.org/ .
<i>WSDL-S</i>	A mechanism to associate semantic annotations with Web services that are described using Web Service Description Language (WSDL). (WS Semantics - WSDL-S [32])
<i>XML Infoset</i>	An abstract data set called the <i>XML Information Set (Infoset)</i> whose purpose is to provide a consistent set of definitions for use in other specifications that need to refer to the information in a well-formed XML document. (XML Information Set [34]).

3.3 Abbreviations

<i>API</i>	Application Programming Interface
<i>FDR</i>	FAA Data Registry
<i>MEP</i>	Message Exchange Pattern
<i>OASIS</i>	Organization for the Advancement of Structured Information Standards
<i>OWL</i>	Ontology Web Language
<i>QoS</i>	Quality of Service
<i>RDF</i>	Resource Description Framework
<i>SLA</i>	Service Level Agreement
<i>SSL</i>	Secure Socket Layer
<i>UDDI</i>	Universal Description, Discovery and Integration
<i>UML</i>	Unified Modeling Language
<i>WS</i>	Web Service
<i>W3C</i>	World Wide Web Consortium
<i>WSDD</i>	Web Service Description Document
<i>WSDL</i>	Web Service Description Language
<i>XML</i>	eXtensible Mark-up Language

4 GENERAL REQUIREMENTS

This section presents general requirements for the format and structure of Web Service Description Documents.

4.1 Format

This section describes requirements for the format of the WSDD.

4.1.1 Text, Grammar and Style

- a. The text SHALL be written in clear and simple language, free of vague terms, or those subject to misinterpretation.
- b. All sentences SHOULD be complete and grammatically correct. Refer to FAA Order 1000.36, FAA Writing Standards [2] for guidance.
- c. The United States Government Printing Office Style Manual [12] SHALL be used as a guide for capitalization, spelling, punctuation, syllabification, compounding words, tabular work and other elements of grammar and style.

4.1.2 Page Numbering

- a. The Cover page SHALL omit the page number.
- b. All pages after the Cover page and before the page containing the first (“Scope”) section SHALL be numbered consecutively with lower-case Roman numerals, starting with ii (for example, ii, iii, and iv).
- c. The first page of the first (“Scope”) section SHALL be numbered with an Arabic numeral 1.
- d. All subsequent pages SHALL be numbered sequentially using Arabic numerals.
- e. The page numbers SHALL be placed at the bottom center of each page.

4.1.3 Page Headers

- a. Each page, including the front cover, SHALL contain a header in the upper right-hand corner.
- b. Each header SHALL contain the WSDD Identifier. NOTE: In most cases, the identifier is assigned by a governing or configuration management organization under whose authority the service is developed or functions.
- c. If the WSDD is a revision to a baselined WSDD, the word “Revision” followed by the revision letter SHALL be included immediately under the WSDD Identifier.
- d. If the WSDD has been approved by a governing or configuration management control organization, the header SHALL include the date of WSDD approval.
- e. If the WSDD is a draft, the header SHALL include the word “DRAFT” in capital letters.

4.1.4 Use of Hyperlinks

To improve the readability and understanding of the WSDD, usage of [hyperlinks](#) is prescribed as follows:

- a. Every term that is used and defined within the WSDD SHOULD be linked via a hyperlink reference to the location of its definition in the WSDD's "Definitions" section.
- b. When the same term is used more than once within the same sentence or paragraph, only the first occurrence of the term SHOULD be referenced.
- c. Every document that is cited within the WSDD SHALL be linked via a hyperlink reference to the location of its bibliographic entry in the WSDD's "Applicable Documents" section.
- d. When a document is quoted within the WSDD, the quote SHALL include a hyperlink reference to the location of the document's bibliographic entry in the WSDD's "Applicable Documents" section.

4.1.5 Use of Diagrams

There are a number of sections in the WSDD where using diagrams is suggested to enhance the understanding of a described topic.

- a. Unified Modeling Language (UML) diagrams are RECOMMENDED since UML is able to concisely describe concepts without implying any specific technology.

4.2 Structure

This section describes the structure of a WSDD. Figure 2 provides a graphical representation of the structure of the entire document.

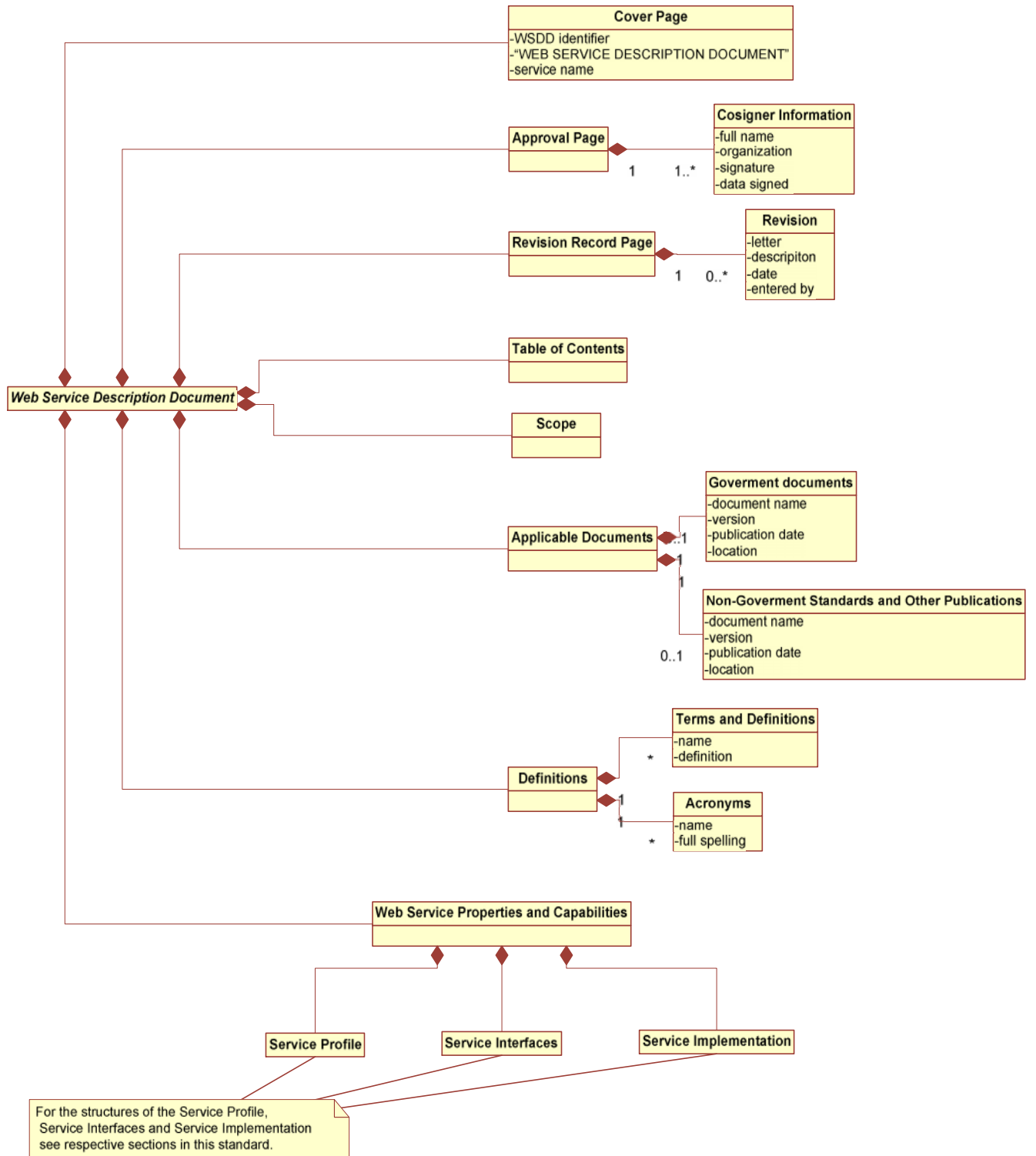


Figure 2. Structure of a WSDD

The “front matter” portion of the WSDD - i.e., cover page, table of contents, definitions, etc. - is consistent with conventions and regulations established for FAA documents. This portion is described below in the Detailed Requirements sections 5.1 through 5.7.

The “core” portion of the WSDD is described in section 5.8, Web Service Properties and Capabilities. It closely follows the structure of the Service Definition Framework set forth by MITRE [25], which in turn uses the concepts and relationships defined in the OWL-S document [23] acknowledged as a Member Submission by the World Wide Web Consortium (W3C). It is composed of three logical parts: Service Profile, Service Interfaces and Service Implementation. Each of these represents an essential part of knowledge about the web service and may serve different needs for the users of a WSDD.

Each part can be characterized as answering a particular question:

- The Service Profile part answers the question "what does the service do?" in a way that is suitable for a service-seeking [agent](#) to determine whether the service meets its needs. This may include information about “what is accomplished by the service, limitations on service applicability and quality of service, and requirements that the service requester must satisfy to use the service successfully” [23].
- The Service Interfaces part answers the question "how does the service work?" by describing the [interface](#) and semantics of a service; that is, it details the semantic content of requests, message formats, data types, transport serialization formats, etc.
- The Service Implementation part answers the question "how does one access the service?" by specifying the communication [protocol](#) and network address. NOTE: the relationship between the Service Interfaces and Service Implementation parts is reminiscent of the relationship between the "abstract" and "concrete" parts of a WSDL document (see section 5.8.1.6 for more details).

This standard uses an approach similar to the approach originated in the WSDL specification wherein the WSDL document is conceptually divided into two pieces of information: an abstract interface in terms of [messages](#) exchanged in interaction and the protocol-dependent details that a user follows to access the service. Separating the WSDD content in like fashion supports reusability and allows the integrity of the WSDD to be maintained even if the underlying technology platform changes. Figure 3 demonstrates the conceptual mapping between a WSDL document and a WSDD.

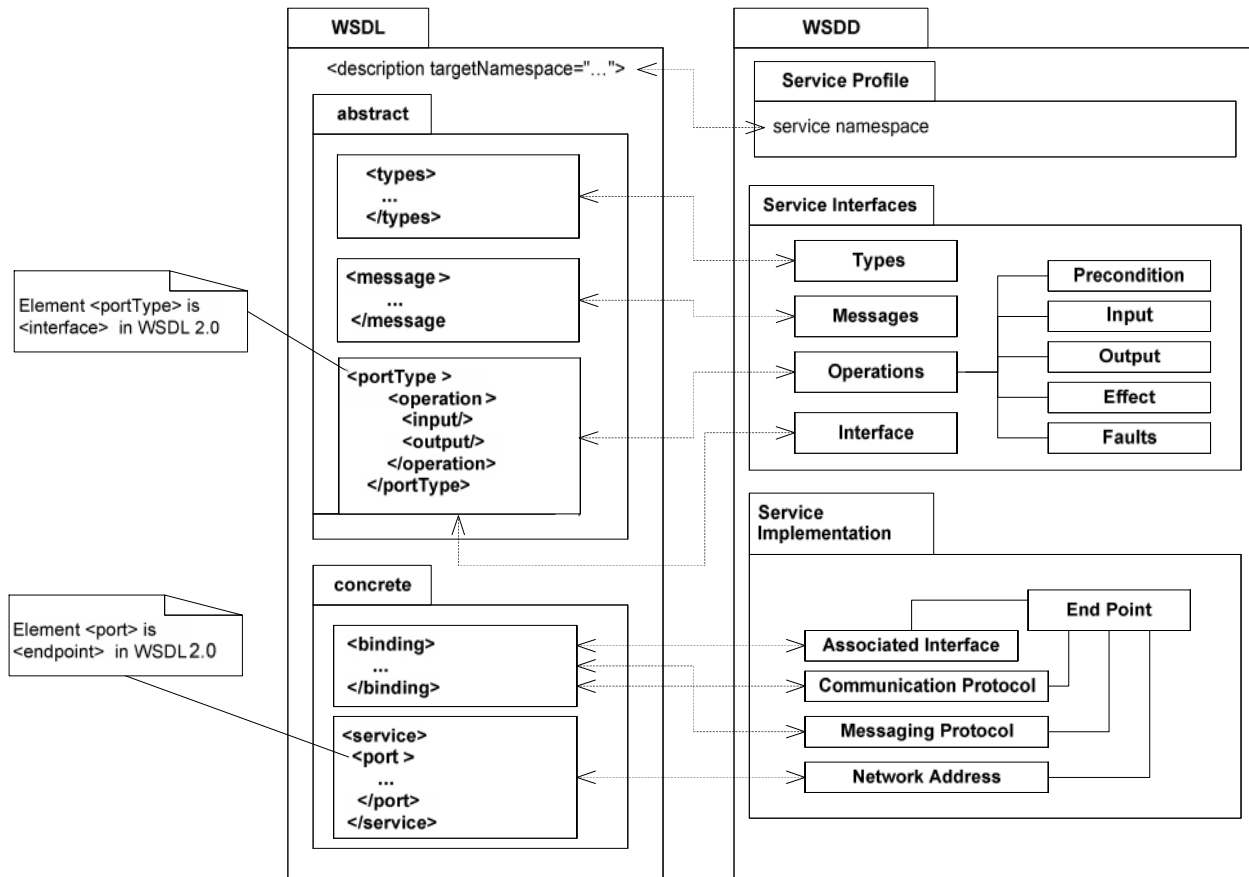


Figure 3. Correlations between Sections of WSDD and WSDL Schema Elements

5 DETAILED REQUIREMENTS

5.1 Cover Page

- a. The WSDD SHALL include a cover page as the first page.
- b. The upper left corner of the cover page SHALL include the FAA signature (the Department of Transportation triskelion figure with the words “U.S. Department of Transportation” and the words “Federal Aviation Administration” below it) in accordance with FAA Order 1700.6, FAA Branding Policy [5].
- c. The line “Web Service Description Document” SHALL be centered above the title.
- d. The title SHALL be the name by which the web service will be known. NOTE: In most cases, the title will consist of the approved service’s name issued by the activity authorized to assign the name. That name will be referred to throughout the WSDD as the web service name.

An example of a WSDD Cover Page is shown in [Appendix A](#).

5.2 Approval Page

Signatures on this page ensure that the interested parties have approved the WSDD content. The approval page may not be required based on the configuration management policies established within a given organization. The following statements apply when signed approval is required.

- a. The approval page SHALL be the first interior page of the document.
- b. The approval page SHALL contain the line “Web Service Description Document” centered above the title of the web service, and the line “Approval Signatures” centered below the title of the web service.
- c. The approval page SHALL include the following information for every cosigner:
 - Cosigner’s full name
 - Cosigner’s organization
 - Cosigner’s signature
 - Date signed

An example of a WSDD Approval Page is shown in [Appendix B](#).

5.3 Revision Record Page

- a. The WSDD SHALL include a revision record page.
- b. The revision record page SHALL contain the line “Web Service Description Document” centered above the title of the web service, and the line “Revision Record” centered below the title of the web service.
- c. When a WSDD is revised, the superseding information SHALL indicate that the revision supersedes the prior issuance of the WSDD, as well as any interim WSDDs if applicable.

- d. Only revisions SHALL be listed.
- e. The revision record page SHALL include the following information for every incorporated revision:
 - Revision letter
 - Brief description of revision
 - Revision date
 - Name of the person who entered this revision record (“Entered by”)

An example of a WSDD Revision Record Page is shown in [Appendix C](#).

5.4 Table of Contents

- a. The WSDD SHALL include a table of contents.
- b. The WSDD SHALL conform to the basic outline shown in Figure 4 below. NOTE: the sections shown in *italics* are optional.

Cover Page
<i>Approval Page</i>
Revision Page
Table of Contents
1 Scope
<i>1.1 Background</i>
2 Applicable Documents
2.1 Government Documents
2.2 Non-Government Standards and Other Publications
3 Definitions
3.1 Terms and Definitions
3.2 Acronyms
4 Web Service Properties and Capabilities
4.1 Service Profile
4.1.1 Service Provider
4.1.1.1 Point of Contact
4.1.2 Service Consumers
4.1.3 Service Functionality
4.1.4 Security
4.1.4.1 Roles
4.1.4.2 Access Control Mechanisms
4.1.4.3 Security Policies
4.1.5 Qualities of Service
4.1.6 WSDL Document
4.2 Service Interfaces
4.2.1 Types
4.2.2 Messages
4.2.3 Operations
4.2.4 List of Interfaces
4.3 Service Implementation

4.3.1	End Points
4.3.1.1	End Point 1
4.3.1.1.1	Associated Interface
4.3.1.1.2	Communication Protocol
4.3.1.1.3	Messaging Protocol
4.3.1.1.4	Network Address
4.3.1.1.5	End Point-Specific Qualities of Service
4.3.1.2	<i>End Point 2</i>
4.3.1.2.1	<i>Associated Interface</i>
4.3.1.2.2	<i>Communication Protocol</i>
4.3.1.2.3	<i>Messaging Protocol</i>
4.3.1.2.4	<i>Network Address</i>
4.3.1.2.5	<i>End Point-Specific Qualities of Service</i>
4.3.1.n	<i>End Point n</i>
4.3.1.n.1	<i>Associated Interface</i>
4.3.1.n.2	<i>Communication Protocol</i>
4.3.1.n.3	<i>Messaging Protocol</i>
4.3.1.n.4	<i>Network Address</i>
4.3.1.1.5	<i>End Point-Specific Qualities of Service</i>
<i>Appendixes</i>	

Figure 4. WSDD Table of Contents

5.5 Scope

- a. Section 1 of the WSDD SHALL provide a scope statement for the WSDD that is a clear, concise abstract of the coverage of the WSDD.

5.6 Applicable Documents

- a. The information about every document listed in section 2 of the WSDD SHALL include the full name of the document, version and/or publication date, and location (preferably network location, i.e. [URL](#)) where a copy can be obtained.
- b. Section 2.1 of the WSDD SHALL list all types of Government standards and other publications cited in the WSDD.
- c. Section 2.2 of the WSDD SHALL list all types of non-Government standards and other publications cited in the WSDD.

5.7 Definitions

- a. Section 3.1 of the WSDD SHALL sufficiently define all terms used in the WSDD to provide for adequate clarity, unless the terminology is generally accepted and not subject to misinterpretation.
- b. Definitions MAY be included by reference to another document.
- c. Terms and their definitions SHALL be listed in alphabetical order.
- d. Section 3.2 of the WSDD SHALL include a list of acronyms and abbreviations used in the WSDD, together with their full spelling.
- e. Acronyms and abbreviations SHALL be listed in alphabetical order.

5.8 Web Service Properties and Capabilities

- a. Section 4 of the WSDD represents the information needed to discover and use a service. This section SHALL include the following subsections:
 - 4.1 Service Profile
 - 4.2 Service Interfaces
 - 4.3 Service Implementation.

Requirements for each are described in their respective subsections below.

5.8.1 Service Profile

Section 4.1 of the WSDD (Service Profile) describes information about what is considered to be the basic, non-functional properties of a web service. Figure 5 illustrates the structure of the Service Profile section of the WSDD.

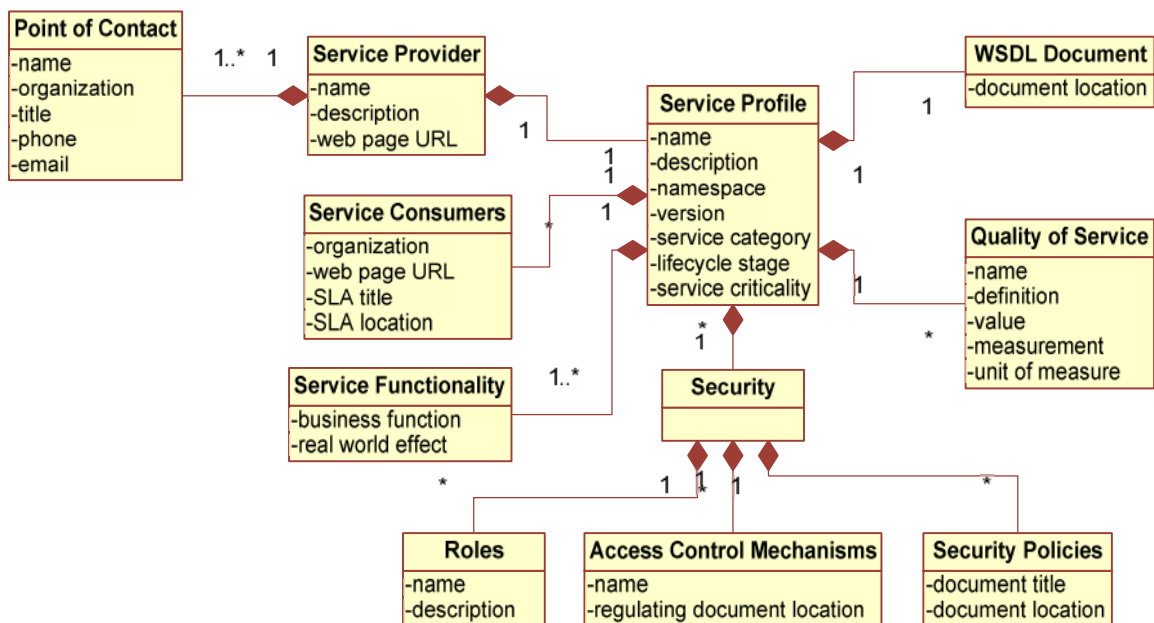


Figure 5. Structure of WSDD Service Profile Section

- a. Section 4.1 of the WSDD SHALL present information about the service profile.
- b. The information SHALL include the name of the service.
- c. The name SHALL be identical with the name of the service provided on the cover page of the WSDD.
- d. The information SHALL include a service namespace. See FAA-STD-063, XML Namespaces [7] for establishing a namespace.
- e. The information SHALL include a brief description of the service. NOTE: That description is similar to or the same as the description to be used to register this

service in an FAA-affiliated registry. For more details, see FAA-STD-064, Web Service Registration [8].

- f. The information SHALL include a service version or revision level.
- g. The information SHALL include a service category.
- h. One or more values representing the service category SHALL be selected from the FAA Service Category [Taxonomy](#) described in section 5.3.5 of FAA-STD-066, Web Services Taxonomies [9].
- i. The information SHALL include the lifecycle stage of the service.
- j. The single value representing the service's lifecycle stage SHALL be selected from the Lifecycle Stage Taxonomy described in section 5.3.7 of FAA-STD-066 [9].
- k. The information SHALL include the level of criticality for the service.
- l. The single value representing the service's criticality level SHALL be selected from the [Service Criticality](#) Taxonomy described in section 5.3.8 of FAA-STD-066 [9].

5.8.1.1 Service Provider

- a. Section 4.1.1 of the WSDD SHALL present information about the provider [organization](#).
- b. The information SHALL include the name of the organization that provides the service.
- c. The provided name SHALL consist of the full name spelled out followed by the acronym by which it is commonly recognized within FAA.
- d. The information MAY include a brief description of the organization.
- e. The information MAY include an accessible reference (e.g. URL) for the web page that supplies information about the web service and/or organization.

NOTE: When the service is registered in an FAA-affiliated registry, the organization name and description should be consistent with the organization name, description and other attributes in the registry. For information about service registration, consult FAA-STD-064 [8].

5.8.1.1.1 Point of Contact

- a. Section 4.1.1.1 of the WSDD SHALL present information for a point of contact, i.e., a person or group within the provider organization, suitable for making a human contact for any purpose.
- b. The information SHALL include the full name of the contact.
- c. The information SHALL include the contact's job title or a brief description of the contact's responsibilities.
- d. The information SHALL include at least one telephone number.
- e. The information SHALL include at least one e-mail address.
- f. The information MAY include a postal address.

5.8.1.2 Service Consumers

- a. Section 4.1.2 of the WSDD SHALL present information about each service consumer.
- b. The information SHALL include the consumer organization's full name and acronym.
- c. The information SHOULD include an accessible reference (e.g. URL) for the web page that supplies information about the organization.

It is a common practice for SOA implementations to establish a contract or agreement between service provider and service consumer. Such an agreement, generally referred to as a Service Level Agreement ([SLA](#)), is primarily the obligation of a service provider to perform a service according to agreed-upon guarantees for QoS parameters that describe and measure the quality aspects of a web service. The concept of SLA implies the ability to offer different levels of service, with performance being the differentiating factor, to different consumers or different groups of users associated with a single consumer. NOTE: defining the form and content of an agreement document is outside the scope of this standard, but this standard assumes that such a document is created as a separate artifact and made available at an accessible location (e.g. stored in a repository).

- d. The information SHALL include any SLA established with the consumer using the following metadata.
 1. The metadata SHALL include the name or title by which the agreement document is formally known.
 2. The metadata SHOULD provide a reference to an accessible location (URL) of the agreement document.
 3. If there is no agreement document, the phrase "No service level agreement has been established" SHALL be specified in section 4.1.2 of the WSDD.

5.8.1.3 Service Functionality

As explained in section 4.2 of this standard, the main goal of the Service Profile section of the WSDD is to describe the specific purpose associated with interacting with a service, i.e., to answer the question of what it is that the service does for a consumer. This ultimate result of using a service is often referred to as the "[real world effect](#)." The real world effect may include:

- "1. Information returned in response to a request for that information,
2. A change to the shared state of defined entities, or
3. Some combination of (1) and (2)." [21]

For example, a real world effect could be knowledge that "the flight has been rerouted" (change in the state) or a "weather forecast" (response to a request for information).

This standard asserts that every web service represents an identifiable [business function](#), or a group of business functions. The goal of the Service Functionality section of the WSDD is to describe the business function(s) and the real world effects that result from the invocations of these business functions.

- a. Section 4.1.3 of the WSDD SHALL present information about the service functionality.

- b. The information SHALL describe the service's business function(s) and real world effects.
- c. The service's business function(s) SHALL be correlated with the real world effect(s).

NOTE: Considering that the Service Functionality section is part of the Service Profile section, it should be written with emphasis on the functionality of the entire service and not on the specific [operations](#), which are addressed in section 4.2.3 of the WSDD.

5.8.1.4 Security

Every web service implements some process, generally referred to as an [access control](#), for verifying the identity of the users, granting the rights and permissions to access system resources, and other processes by which access to system resources is regulated according to a security policy. This section provides requirements for describing access control mechanisms and security policies.

- a. Section 4.1.4 of the WSDD SHALL describe the [security mechanisms](#) - the processes or devices incorporating such processes - that will be used in a system to implement a [security](#) service that is provided by or within the system.
- b. If the security mechanism implemented in a service utilizes a security service that resides outside of the web service, that is, if the web service delegates security (e.g. to a dedicated security service) and that security service is described in an associated document, then description of security mechanisms MAY be deferred to that document by providing the following information:
 - 1. Information SHALL include the formal name of the document.
 - 2. Information SHOULD include an accessible reference (e.g. URL) to the document.

5.8.1.4.1 Roles

To provide more granular access control and reduce the amount of administrative effort, web services often deploy role-based access control (RBAC), sometimes referred to as role-based security. This approach requires that different levels of permission (i.e., roles) be assigned to the web service users in order to perform specific operations or job functions.

- a. When a service provider deploys a role-based approach, section 4.1.4.1 SHALL include information about consumer roles using the following metadata:
 - 1. The metadata SHALL include the name of the role.
 - 2. The metadata SHALL include a brief description of that role.

5.8.1.4.2 Access Control Mechanisms

- a. Section 4.1.4.2 of the WSDD SHALL list each access control mechanism used in or by the web service using the following metadata:
 - 1. The metadata SHALL include the name of the access control mechanism.
 - 2. The metadata SHOULD include an accessible reference (e.g., URL) to the protocol or specification document that regulates that mechanism.

5.8.1.4.3 Security Policies

- a. Section 4.1.4.3 of the WSDD SHALL provide the policy or policies established and/or enforced by a service provider.
 1. If policy documents are stored elsewhere, the accessible references to the documents (e.g. URLs) SHALL be provided.
- b. If the security policy described is in compliance with the WS-Policy Framework 1.5 [31], the XML document SHALL be provided in section 4.1.4.3.
 1. If the WS-Policy security-related part is brief, then it SHALL be included in this section.
 2. If the WS-Policy security-related part is extensive, then an accessible link SHALL be provided.

5.8.1.5 Qualities of Service

- a. Section 4.1.5 of the WSDD SHALL list and provide information about Quality of Service (QoS) parameters associated with the provided service.
- b. Section 4.1.5 SHALL describe each QoS parameter using the following metadata:
 1. The metadata SHALL include the QoS parameter's name.
 2. The metadata SHALL include the QoS parameter's value.
 3. The metadata SHALL include the QoS parameter's definition. See section 6.2 of FAA-STD-064 [8] to help ensure that the definition is as informative and understandable as possible.
 4. When a QoS parameter's values represent a quantitative measure, the metadata SHALL include a description of how the values are measured or calculated.
 5. When a QoS parameter's values represent a quantitative measure, the metadata SHALL include the unit of measure (e.g., seconds, percentage).

NOTE: it is important to realize that the list of QoS parameters required in this section is a part of the Service Profile and is therefore primarily intended for a user who is looking for a service that meets certain criteria. For this reason, the list of QoS parameters should represent those qualities that are part of service design and not those that may represent a current state of network or hosting environment (e.g., a service may be designed to meet a certain *capacity* measure, but *reliability* may depend on a hosting server).

Examples of several typical QoS parameters for a web service, followed by their descriptive metadata, are shown below. NOTE: these examples are non-normative, which means that the QoS parameters' values, definitions, and calculation methods do not relate to nor prescribe any standards.

<i>QoS Parameter</i>	<i>Value</i>
Availability	99.990
Capacity	200

Response Time	30
---------------	----

The QoS parameters should be understood and evaluated as follows:

<i>Name</i>	<i>Definition</i>	<i>Calculation Method</i>	<i>Units of Measure</i>
Availability	A measure of the lowest probability that a system or constituent piece will be operational during any randomly selected period of time, or, alternatively, the fraction of the total available operating time that the system or constituent piece is operational. (FAA SEM 4.8.2 [11])	$100 * ((\text{Maximum Available Hours} - \text{Total Outage Time}) / \text{Maximum Available Hours})$	Percentage of available time that the system is operationally available, accurate to 3 decimal places
Capacity	A measure of the maximum number of service users/requests that can be served simultaneously and continuously.	Continuous measurement.	Number of requests
Response Time	A measure of the longest average time period required to complete a service request, from the time the requester invokes the service to the time the requester receives the last byte of the response.	Running average over the last 365 days of intended operation.	Milliseconds

5.8.1.6 WSDL Document

As stated in section 1, the intention of this standard is to establish the WSDD as a single-source document that captures Information necessary to describe a web service. Nevertheless it is also the case that there are other artifacts that are used to describe how to deploy and connect to a web service. These artifacts are built in compliance with [open standards](#) and designed to provide ubiquitous software interoperability across

platforms and networks, and because they are based on the [XML Infoset](#), they are often collectively referred to as "machine-consumable" or "machine-processable" service descriptions.

Although this standard does not mandate nor suggest any specific technology, it recognizes that the Web Services Description Language (WSDL) set forth by W3C [28], [29] is today the *de facto* industry standard. Moreover, all FAA implementations of web services as of this standard's approval date use one of the versions of the WSDL specification for developing machine-processable service descriptions.

For this reason as well as for the sake of brevity, all requirements in this section use the term "WSDL document" as a generic term for any recognized, open standards-based, machine-processable service description artifact.

- a. Each WSDD SHALL be accompanied by a WSDL document.
- b. Section 4.1.6 of the WSDD SHALL identify the title, version, and location of the open standard with which the WSDL document complies.
- c. Section 4.1.6 of the WSDD SHALL contain the name and location of the WSDL document.
 1. When an accessible location of the WSDL document is available, that location (e.g. URL) SHALL be provided.
 2. When an accessible location is not available, the WSDL document itself SHALL be reproduced in the WSDD, either as part of section 4.1.6 or in an Appendix.

NOTE: while the WSDL-based format is by far the most common standard for formal machine-processable service description, there are other XML-based open standards for describing web services that are used or have the potential to be used in FAA. For example, the Open Geospatial Consortium (OGC) has produced a number of specifications for developing geospatially-enabled web services. These specifications define the way to describe service-level metadata in XML-encoded artifacts, but the syntax of these artifacts is completely different from WSDL (e.g., service-level metadata is described in a "capabilities" document, an XML-based document generated as a response to a GetCapabilities request in OGC-compliant services). There are concerted industry efforts underway that support describing OGC-compliant web services using syntaxes defined in the WSDL specification, i.e., to "wrap" the OGC-prescribed capabilities document into the WSDL document (see for example ["OWS 1.2 SOAP Experiment Report: Open GIS Consortium"](#)). This standard asserts that for OGC-compliant services a "capabilities document" fulfills the requirement for delivery of the WSDL document.

5.8.2 Service Interfaces

This section provides requirements for describing the types and semantics of messages and the message exchange patterns that are involved in interacting with the service, together with any conditions implied by those messages.

- a. Section 4.2 of the WSDD SHALL describe the interface characteristics of the web service, i.e., how a request for the service should be constructed, without considering the technology used to transmit messages.

Web service interface characteristics and their relationships are depicted in Figure 6.

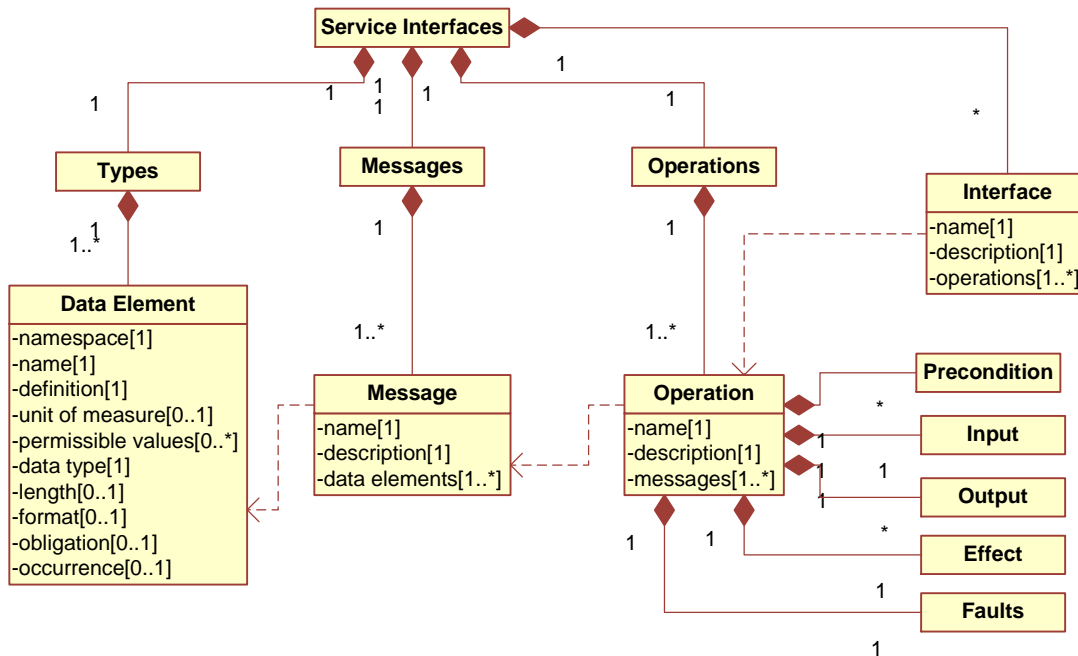


Figure 6. Structure of WSDD Service Interfaces Section

5.8.2.1 Types

This section provides requirements for describing [data elements](#) (types) used in communication between the consumer and provider. WSDL is not tied exclusively to a specific typing system, but it uses the W3C XML Schema specification [33] as its default choice.

- a. Section 4.2.1 of the WSDD SHALL list all data elements (types), whether primitive or complex.
- b. Section 4.2.1 of the WSDD SHALL describe each element using the following metadata:
 1. The metadata SHALL include the element namespace. NOTE: if all elements in the list share the same namespace, the namespace is indicated once for the whole list.
 2. The metadata SHALL include the element name.
 3. The metadata SHALL include the element definition. See section 6.2 of FAA-STD-064 [8] to help ensure that the definition is as informative and understandable as possible.
 4. When a data element's values represent a quantitative measure, the metadata SHALL include the unit of measure (e.g., feet, kilograms, degrees Fahrenheit, dollars).
 5. When a data element's values are constrained to a prescribed set of values, the metadata SHALL specify the permissible values by any of the following means: the name of a list (e.g. USPS State Codes), reference to

- a source (e.g. FAA Order 7350.7 Location Identifiers), a range of numbers, a textual description, or listing the values.
6. If the values are coded, the meanings of the codes SHALL be provided.
 7. The metadata SHOULD include data type (e.g. Boolean, date, decimal).
NOTE: the data type may not be applicable for a complex element.
 8. The metadata SHOULD include the maximum length of the data element.
NOTE: the length of a data element may be not applicable or undefined (e.g. complex data types, Boolean, decimal, integer).
 9. When a data element is rendered in a special format or layout, the metadata SHOULD include the format string.
 10. The metadata SHALL include the obligation of the element (allowed values: Optional, Required).
 11. The metadata SHALL include the maximum occurrence of the element (e.g. 0,1,...,unbounded).
- c. The described type (data element) SHOULD be registered with the [FAA Data Registry \(FDR\)](#) in accordance with FAA-STD-060, Data Standard for the National Airspace System [6].
1. If the data element has been registered with the FDR, the metadata SHALL include the element's registration identifier issued by FDR.
 2. When a valid FAA registration identifier is provided, the metadata in requirements b.3 through b.9 MAY be omitted from section 4.2.1 of the WSDD.
 3. If the data element has not been registered with the FDR, the metadata specified in requirements b.3 through b.6 SHALL be presented in section 4.2.1 of the WSDD regardless of whether or not they are rendered in other artifacts associated with the service.
- d. The metadata attributes specified in requirements b.1 through b.6 SHALL be presented in section 4.2.1 of the WSDD regardless of whether or not they are rendered in other artifacts associated with the service.
- e. When the metadata attributes specified in requirements b.7 through b.11 are rendered in the WSDL document or XML schema file associated with the web service and appended to or referenced in this WSDD, these attributes MAY be omitted from section 4.2.1 of the WSDD.
- f. Section 4.2.1 of the WSDD MAY include a diagram that depicts a logical model of the data elements listed. Using Unified Modeling Language (UML) diagrams is a RECOMMENDED method for concisely describing concepts without implying a specific technology.
- g. When any part of any data element's information is duplicated in section 4.2.1 of the WSDD and the WSDL file, this information SHALL be completely synchronized.

The following is an example of a list of types.

<i>Name</i>	<i>Definition</i>	<i>Occurrence</i>	<i>Obligation</i>
sessionId	Unique identifier for this client/service session. The value is assigned in response to "initiate" request. All further	1	Required

	messages within that session contain that identifier as one of the parameters.		
requestId	Uniquely identifies this message. In the case of a request message, this identifier can be used to monitor and control the processing resulting from the request message.	0...1	Optional

5.8.2.2 Messages

This section provides requirements for describing messages exchanged between a provider agent and a requester agent. It is important to understand that every message that is listed in WSDD section 4.2.2 "Messages" is the aggregation of parts (data elements), each of which is described in WSDD section 4.2.1 "Types".

- a. Section 4.2.2 of the WSDD SHALL list all messages to be exchanged.
- b. Section 4.2.2 of the WSDD SHALL describe each message using the following metadata:
 1. The metadata SHALL include the message name.
 2. The metadata SHALL include the message description. See section 6.2 of FAA-STD-064 [8] to help ensure that the description is as informative and understandable as possible.
 3. The metadata SHALL include a list of all data elements that constitute the message.
 4. All data elements that constitute the message SHALL be defined in section 4.2.1 of the WSDD as prescribed in section 5.8.2.1 of this standard.
- c. Section 4.2.2 of the WSDD MAY include a diagram that depicts a logical model of the messages listed. Using Unified Modeling Language (UML) diagrams is a RECOMMENDED method for concisely describing concepts without implying a specific technology.

The following is an example of a list of messages.

<i>Name</i>	<i>Definition</i>	<i>Types</i>
CloseIn	Used to inform a service that a previously obtained session indicated as part of the message is no longer required.	sessionId, requestId
CloseOut	Used to inform a service requester that an interactive session with id that provided as part of the message has been terminated.	sessionId

5.8.2.3 Operations

This section provides requirements for describing the set of operations offered by a service provider agent. Every operation that is listed in WSDD section 4.2.3 "Operations" represents the patterns and content of interactions of messages described in WSDD section 4.2.2 "Messages".

- a. Section 4.2.3 of the WSDD SHALL describe every operation offered by the web service.
- b. Each operation description SHALL include a brief summary of the pattern and goals of the actions that constitute the operation. For example, “allows client to retrieve current status of a specified flight”.
- c. Each operation description SHALL indicate a Message Exchange Pattern (MEP).
 1. The single value representing the MEP SHOULD be selected from the Message Exchange Pattern Taxonomy described in section 5.3.11 of FAA-STD-066 [9].
 2. If a value that represents the MEP is not available in section 5.3.11 of FAA-STD-066 [9], Message Exchange Pattern Taxonomy, the MEP SHALL be provided accompanied by a complete and coherent description of it.
- d. Each operation SHALL be described using five conceptual categories as follows:
 1. [Precondition](#). This part SHALL describe the state or condition that should be true before interaction between software agents can begin. A typical example is, “the user has logged in and been authorized”.
 2. [Input](#). This part SHALL describe information that initiates interaction. The information can often be mapped to one of the messages provided in WSDD section 4.2.2 “Messages”.
 3. [Output](#). This part SHALL describe information that is produced in response to a service request. The information can often be mapped to one of the messages provided in WSDD section 4.2.2 “Messages”, and sometimes there is no output generated (e.g., in solicitation or notification scenarios).
 4. [Effect](#). This part SHALL describe the expected or “best case scenario” state or condition that exists after the operation is terminated. For example, “requested map was generated and returned to a client”.
 5. [Faults](#). This part SHALL describe the behavior of the operation in case the operation fails, i.e., describe the errors that could be generated in response to conditions that resulted in operation failure.
- e. Section 4.2.3 of the WSDD MAY include a diagram that depicts a logical model of the operations listed. Using Unified Modeling Language (UML) diagrams is a RECOMMENDED method for concisely describing concepts without implying a specific technology.

The following is an example of an operation description.

Operation Name	close
Description	Allows client to terminate an interactive session with a server.
MEP	In-Out (FAA-STD-066 Message Exchange Pattern Taxonomy)
Precondition	Client has previously initiated identified session.
Input	Message CloseIn containing session Id and optionally request Id.
Output	Message CloseOut containing the session Id for terminated session.
Effect	Optional result document returned to requesting client, and results sets created during the session are deleted and other resources are deleted.

Faults	The pre-defined errors are: Missing Parameters Value, Invalid Parameter Value.
--------	--

5.8.2.4 List of Interfaces

This section provides requirements for describing the list of interfaces exposed by the web service. Every interface defined in WSDD section 4.2.4 "List of Interfaces" is a named set of operations, each of which is also described in WSDD section 4.2.3 "Operations". In the context of a WSDD, It may be said that an interface characterizes the behavior of the service or, alternatively, that an interface is an abstract representation of the service type.

- a. Section 4.2.4 of the WSDD SHALL list all interfaces being offered by the service.
- b. Section 4.2.4 of the WSDD SHALL describe each interface using the following metadata:
 1. The metadata SHALL include the interface name that will uniquely identify the interface throughout the WSDD to refer to that interface.
 2. The metadata SHALL include the interface description.
 3. The metadata SHALL include a list of all operations that constitute the interface.
 4. All operations that constitute the interface SHALL be defined in section 4.2.3 of the WSDD as prescribed in section 5.8.2.3 of this standard.

The following is an example of a list of interfaces. The example assumes that the three operations *login*, *query*, and *delete* have been defined and that the service exposes two interfaces as follows:

<i>Name</i>	<i>Definition</i>	<i>Operations</i>
QueryOnlyInterface	Used to allow a user to query the data available via the web service.	login, query
AdminInterface	Used to allow an administrator to query the data and delete records via the web service.	login, query delete

5.8.3 Service Implementation

This section provides requirements for describing how the service will be connected to a concrete implementation of technology and an entry point or points by which the service can be accessed.

The structure of the WSDD's implementation section is depicted in Figure 7.

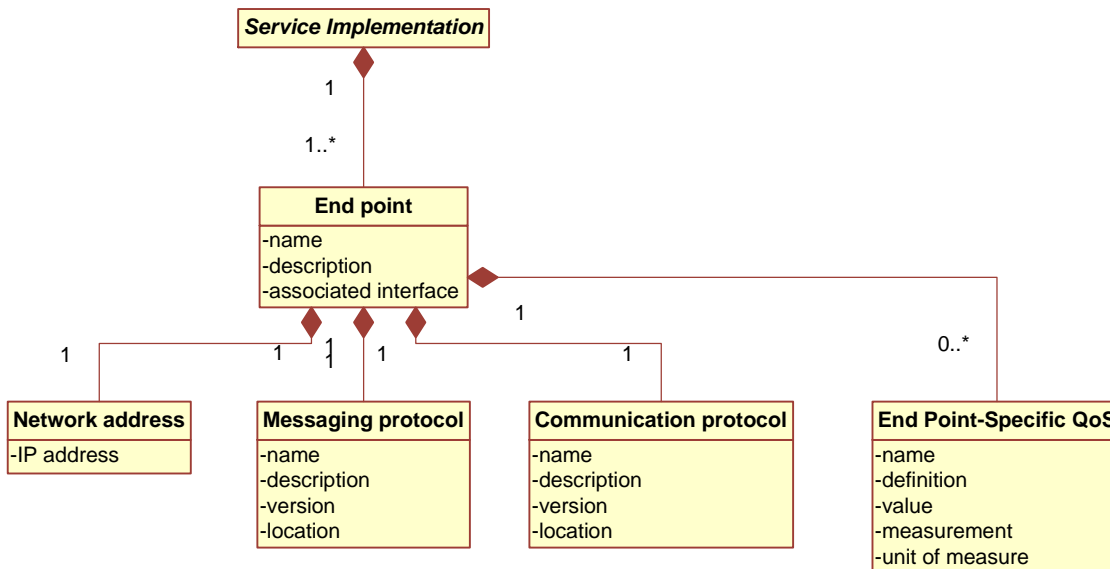


Figure 7. Structure of WSDD Implementation Section

5.8.3.1 End Points

In the context of this standard, the information that describes how a web service interface is associated with underlying technology protocols and with a certain network address is referred as an [end point](#). NOTE: the term “end point” used in this standard should not be confused with the term “endpoint” defined in the WSDL specification [29] or the term “EndPoint” defined in the Web Service Description Requirements [30] (both of which documents were produced by W3C).

- a. Section 4.3.1 of the WSDD SHALL contain a list of all end points by which the web service can be accessed.
- b. The list SHALL contain at least one end point.
- c. Section 4.3.1.1 of the WSDD SHALL describe the first end point
- d. If there are multiple end points, they SHALL be described in consecutive additional WSDD sections with headings numbered 4.3.1.2 (or 4.3.1.n, as appropriate).
- e. The heading of the WSDD section describing each end point SHALL include the name that will be used throughout the WSDD to refer to that end point.
- f. Each end point description SHALL include the following components:
 - Associated interface (WSDD section 4.3.1.n.1)
 - Communication protocol (WSDD section 4.3.1.n.2)
 - Messaging protocol (WSDD section 4.3.1.n.3)
 - Network address (WSDD section 4.3.1.n.4)
 - End point-specific qualities of service (WSDD section 4.3.1.n.5)
 These components are described in greater detail below.
- g. Situations may arise in which one or more of the components are the same for all end points. In this case, to reduce unnecessary replication of identical WSDD subsections, the metadata associated with those components MAY be described once. Appendix D provides an example of one way to deal with such a situation.

5.8.3.1.1 Associated Interface

- a. Section 4.3.1.1.1 (or 4.3.1.n.1, as appropriate) of the WSDD SHALL provide the name of the interface associated with this end point.
- b. There SHALL be only one interface associated with this end point.
- c. The name of the interface associated with this end point SHALL be identified in section 4.2.4 of the WSDD.

5.8.3.1.2 Communication Protocol

Communication protocol is the protocol that is responsible for moving encapsulated units of data among [software agents](#). Industry sources also refer to this protocol as a “transport” protocol or “wire” protocol. Communication protocol can be loosely mapped to the Application Layer, or rather to one of the Application Layer protocols, in both the Open Systems Interconnection (OSI) Reference Model and the Internet Protocol Suite (TCP/IP). The typical examples of communication protocol are: HTTP, FTP, SMTP, and JMS.

- a. Section 4.3.1.1.2 (or 4.3.1.n.2, as appropriate) of the WSDD SHALL describe the communication protocol used by the web service at this end point by providing the following metadata:
 1. The metadata SHALL include the protocol name.
 2. The metadata SHALL include the protocol description.
 3. The protocol name and description SHOULD be selected from the Service Transport Taxonomy described in section 5.3.10 of FAA-STD-066 [9].
 4. When the specification that defines the protocol has multiple versions, the metadata SHALL include the protocol version.
 5. The metadata SHOULD include a reference to an accessible location (URL) of the protocol specification.

5.8.3.1.3 Messaging Protocol

The messaging protocol, which is a protocol for exchanging structured information in the implementation of a web service, usually relies on a communication protocol for message transmission. The web services messaging protocol is almost always associated with SOAP, although there are some notable exceptions, e.g. OGC-based implementations.

- a. Section 4.3.1.1.3 (or 4.3.1.n.3, as appropriate) of the WSDD SHALL describe the messaging protocol used by the web service at this end point by providing the following metadata:
 1. The metadata SHALL include the protocol name.
 2. The metadata SHALL include the protocol description.
 3. When the specification that defines the protocol has multiple versions, the metadata SHALL include the protocol version.
 4. The metadata SHOULD include a reference to an accessible location (URL) of the protocol specification.

5.8.3.1.4 Network Address

- a. Section 4.3.1.1.4 (or 4.3.1.n.4, as appropriate) of the WSDD SHALL describe the network address at which the web service can be invoked.

5.8.3.1.5 End Point-Specific Qualities of Service

When a web service has multiple end points and deploys different communication protocols in order to address different consumer needs, it is essential to describe the QoS that are specific to each end point.

- a. If there are QoS specific to this end point, section 4.3.1.1.5 (or 4.3.1.n.5, as appropriate) of the WSDD SHALL describe each QoS parameter using the following metadata:
 1. The metadata SHALL include the QoS parameter's name.
 2. The metadata SHALL include the QoS parameter's value.
 3. The metadata SHALL include the QoS parameter's definition. See section 6.2 of FAA-STD-064 [8] to help ensure that the definition is as informative and understandable as possible.
 4. When a QoS parameter's values represent a quantitative measure, the metadata SHALL include a description of how the values are measured or calculated.
 5. When a QoS parameter's values represent a quantitative measure, the metadata SHALL include the unit of measure (e.g., seconds, percentage).
- b. If there are no QoS specific to this end point (i.e. all QoS for the end point pertain to the web service as a whole), the phrase "No end point-specific qualities of service have been defined" SHALL be specified in section 4.3.1.1.5 (or 4.3.1.n.5, as appropriate) of the WSDD.

NOTE: Section 4.1.5 of the WSDD addresses the QoS for the web service as a whole; section 4.3.1.1.5 (or 4.3.1.n.5, as appropriate) of the WSDD emphasizes those QoS that pertain to a particular end point. These two sections should not overlap or contradict each other but rather should complement one another.

5.9 Appendixes

- a. Appendixes MAY be added to the WSDD to express additional information, such as metadata descriptions, architectural overview descriptions for composite services, special preparations for delivery of the service, etc.

6 Appendixes

Appendix A. Example of a WSDD Cover Page



U.S. Department of
Transportation
**Federal Aviation
Administration**

**FAA-X-XXX
Revision A
December 4, 2009**

**Web Service Description Document
Special Activity Airspace Management Web Services,
Aeronautical Information Management (AIM)**

Appendix B. Example of a WSDD Approval Signature Page

**FAA-X-XXX
Revision A
December 4, 2009**

**Web Service Description Document
Special Activity Airspace Management Web Services,
Aeronautical Information Management (AIM)**

Approval Signatures

Name	Organization	Signature	Date Signed

Appendix C. Example of a WSDD Revision Record Page

**FAA-X-XXX
Revision A
December 4, 2009**

**Web Service Description Document
Special Activity Airspace Management Web Services,
Aeronautical Information Management (AIM)**

Revision Record

Revision Letter	Description	Revision Date	Entered By

Appendix D. Example of WSDD Section 4.3 for a Service whose End Points differ only by Network Address

4.3 Service Implementation

4.3.1 End Points

4.3.1.1 End Point “XYZEndPoint”

All end points described in section 4.3.1 and collectively identified as “XYZEndPoint” have a common associated interface, communication protocol and messaging protocol, and differ only by a network address. To avoid unnecessary redundancy, the following should be noted:

- Section 4.3.1.1.1 identifies the associated interface common to all end points.
- Section 4.3.1.1.2 identifies the communication protocol common to all end points.
- Section 4.3.1.1.3 identifies the messaging protocol common to all end points.

4.3.1.1.1 Associated Interface

Associated interface: XYZPortType (see section 4.2.4 for details).

4.3.1.1.2 Communication Protocol

<i>Protocol:</i>	Hypertext Transfer Protocol (HTTP)
<i>Description:</i>	The communications protocol used to connect to servers on the World Wide Web. Its primary function is to establish a connection with a web server and transmit HTML pages to the client browser.[FAA-STD-066 section “5.3.2.10 Service Transport Taxonomy” urn:us:gov:omb:fea:trm:serviceTransport#http]
<i>Version:</i>	HTTP/1.1
<i>Specification Location:</i>	http://www.w3.org/Protocols/rfc2616/rfc2616.html

4.3.1.1.3 Messaging Protocol

<i>Protocol:</i>	Simple Object Access Protocol (SOAP)
<i>Description:</i>	The lightweight protocol intended for exchanging structured information in a decentralized, distributed environment.
<i>Version:</i>	1.2
<i>Specification Location:</i>	http://www.w3.org/TR/soap12-part1/

4.3.1.1.4 Network Address

<i>EndPoint</i>	<i>Network Address</i>
1	http://some.address1
2	http://some.address2
3	http://some.address3
... etc.	

4.3.1.1.5 End Point-Specific Qualities of Service

No end point-specific qualities of service have been defined.